From:
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Re:
Application Number: 10/533,658

Dear Examiner:

This communication is in response to your office action mailed on 10/17/2007. Thank you for the time you have spent on this, in particular finding and going through the extremely long application filed by Agee et al.

On page 2 of the office action you make a comment that "this application currently names joint inventors". I am confused by this as there is only one inventor, namely myself, Niket Keshav Patwardhan. I drop the middle name when it is not explicitly asked for, and when signing documents I often use only my first name. Please update the records to indicate that there is only one inventor.

I preface my response with the note that the primary basis of the rejections is the application filed by Agee et al. It is not an allowed patent. Therefore, to use it as prior art one needs to show that what is described is actually implementable or useful - otherwise any additions in other applications that make it implementable or useful make those applications allowable as patents. Agee et al is a long application consisting of many relatively unrelated claims. To reject a claim based on components of Agee et al's application requires that the same relationship be shown between the components in Agee et al as is prescribed in this application. Also I note that patents can be granted for not only for a new device, but also for a new use of an existing device, or an improvement to an existing device.

With respect to claim 1, I accept that there is prior art. I therefore cancel claim 1 - standing alone. However, claim 1 established the preconditions for this invention, namely that parts of multiple messages get transmitted simultaneously in the analog symbols that are subject to degradation by noise during the communication process, and that the corresponding digital symbols have at least 2 bits (it is an M-ary digital communication system as described in paragraph 20 of Agee et al). Therefore I am incorporating the essential elements of claim 1 in claim 2.

On page 4, with respect to claim 2, you repeat the language of my claim "selected from a hierarchy of non-confusable groups" and say a mechanism to do this is clearly disclosed in paragraph 20 of Agee et al. I see nothing in Agee about creating a hierarchy of symbols and selecting the bits in the digital symbol based on this hierarchy. This is the essential element of the invention described in this application. It prescribes a very specific mapping between the digital symbols and the analog symbols in the DA and AD convertors, and is dependent on the physics of the channel between the DA and AD converters and the properties of the converters themselves. The mapping would be that the most significant bits of the digital symbol distinguish between the groups most immune to confusion because of noise or imperfections, and is described in the amplitude modulation example. Paragraph 2 of the "Brief Summary of the Invention" fully describes the "hierarchy of non-confusable groups". You reference the phrase in Agee paragraph 20 "two or more bits to form symbols". This phrase merely says to put the bits together, and has no implications on the construction of the DA and AD converters and how they map between the digital and analog symbols, or on how to map the message bits onto the symbol bits. I changed the language of the last clause in claim 2 to be more clear about how the bits of the multiple messages map onto the bits of the digital symbols, in case there is an issue there. You reference the phrase in Agee paragraph 20 "one of the M signals is transmitted during each symbol period". This phrase merely means that one analog symbol is transmitted during each signal period and has no implications on the specific mapping to be used between the digital and analog symbols other than that there be some fixed one. You reference the phrase "transmit only one value set of phase and amplitude" in Agee paragraph 20 - this merely means in the context of the whole sentence that one QAM constellation point can communicate 6 bits of information in 64 QAM. Again, Agee et al give absolutely no guidance on how the 6 bits are arranged in the digital symbol and what aspect of the analog symbol each bit controls. In my invention I would look at the QAM symbols - 64 QAM typically has 32 amplitude levels and two possible phases (0 and 90 degrees) and phase is most resistant to noise in an RF system. So I would make the most significant bit of the digital symbol control the phase in the DA converter (selecting between the group of symbols with phase=0 and the group of symbols with phase=90 degrees), and then the remaining 5 bits control the amplitude in standard fashion. In a laser based system which has a lot of phase noise, I would make the amplitude bits most significant, and the bit controlling the phase the least (or even just use a 64 level amplitude

system with no phase bit). Murai is irrelevant, as even in claim 1 I did not require the RF modulators to be present. Paragraph 20 of Agee basically describes M-ary digital modulation schemes - while I need this in claim 2, it is not all of claim 2. I believe Agee does not cover all of what is claimed in Claim 2 and so ask that claim 2 be allowed.

On page 5, you reject claim 3. Guard bands are a standard method used in the frequency domain, because bandpass filters cannot have abrupt edges in real practice. In Agee et al. paragraph 202 they are specifically used around the tone bands to prevent signals in one tone band from affecting another tone band. Paragraph 295 of Agee et al describes the use of guard bands in the time domain. They have never been applied in the digital domain as far as I know, and certainly not in the "probability of confusion" domain. In particular, in any of the prior art on guard bands the size of the guard band does not change depending on the significance of the signal band it is protecting, as would happen if bits were unused in the digital symbol constructed as per claim 2. I respectfully disagree that this is an obvious extension. This claim represents a separately patentable improvement over claim 2, and so I ask that this claim also be allowed.

On page 5, you reject claim 4 based on paragraph 44 and paragraph 310 of Agee et al. First of all, paragraph 44 of Agee et al refers to multiple remote transmitters transmitting to the same base station, and not to the base station transmitting to multiple remote receivers. In the prescribed direction there is an implementability issue with determining the necessary constants in the presence of noise local to the remote receivers. Secondly, my invention does not require a multi-element antenna array, ie both the base station and the remote receivers can have a single element antenna array. So it is not clear paragraph 44 even applies to my application. Paragraph 310 of Agee et al merely describes how to perform the trellis encoding and describes a process that goes from one set of digital symbols to another set of digital symbols. Agee et al does not care about the relationship between the digital symbols and the analog ones, or about reserving some of the bits of the encoded signal for messages to some stations. Tellingly, in paragraph 311 they describe a "smearing" process that distributes the information in the input "vectors" over the output "vectors", effectively equalizing the probability of error over all bits of the input symbols. I therefore strongly disagree that paragraph 310 inherently teaches to use the most significant bits when transmitting to stations where the S/N ratio is weak and to use the least significant bits when transmitting to stations where the S/N ratio is strongest. Given that neither paragraph seems to apply, and that claim 4 describes a separately patentable use of the system of claim 3, I ask that claim 4 be allowed.

Starting on page 5, you reject claim 5. Similar to the discussion for claim 4, paragraph 310 of Agee et al merely describes how to perform the trellis encoding and describes a process that goes from one set of digital symbols to another set of digital symbols. Agee et al does not care about the relationship between the digital symbols and the analog ones, or about reserving some of the bits of the encoded signal for the higher priority messages. Tellingly, in paragraph 311 they describe a "smearing" process that distributes the information in the input "vectors" over the output "vectors", effectively equalizing the probability of error over all bits of the input symbols. I strongly disagree that paragraph 310 inherently teaches that higher priority messages use the more significant bits; in fact, taken together with paragraph 311, Agee teaches a method that eliminates any possibility of priority ranking between messages that are sent simultaneously! Agee et al is clearly not applicable to claim 5, and claim 5 teaches a separately patentable use of the system of claim 3, and so I ask that claim 5 be allowed.

On page 6, you reject claim 6 based on paragraphs 193 and 245 of Agee et al. The channel referred to in claim 6 is one of the channels created by the system described in claim 2. In the second paragraph of the "Brief Summary of the Invention" is a description of the "channels" created by the system. Although in a wireless system the signal will go over the air, I am not sure how the reference to the air interface describes a process of selecting the new form of channel. But I agree that without the new form of channel claim 6 cannot stand on its own, and needs to be more specific about the computation and selection process, and so I withdraw this claim.

On page 7, you reject claim 7 based on Agee et al and Weber et al. I accept that use of frame synchronization marks is prior art, as is the retransmission of messages not acknowledged as being correct. However, the state of the art as presented in Weber et al simply retransmits the frame until a correct frame is received (discarding the erroneous frames), and no attempt is made to combine the information in the erroneous frames to derive a correct message. In this claim, the erroneous frames are expected to be added together (the word "sums" is used in the second last paragraph of "The Best Mode of carrying out the Invention") in a frame channel buffer. Since the use of the words "added to" is ambiguous, I will modify the third clause of the claim to read "where messages not correctly received are summed in a frame channel buffer". However, I realize now the summing process is still not completely specified in either the specification or the claim, and I withdraw the claim at this time.

Based on the fact that I am cancelling claim 1, and based on your objections, I am cancelling claims 8 and 9.

I note that there was some inconsistency in my application with respect to whether a method, device or system was being claimed. I am therefore revising claims 3, 4, 5 and 6 to be consistent on this matter.

Sincerely,

Niket Patwardhan

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